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ABSTRACT

The purpose of this study was to evaluate the roles of interest, knowledge, and learning strategies on recall within a specific subject domain at an early stage of learning. Students (n=17) at two levels in a postgraduate music therapy course were assessed for their levels of prior knowledge, interest, and the number of strategies they used to process information. They were presented with a video clip of a music therapy session and asked to recall as much as they could of what transpired. The following week they were asked again to complete further questionnaires and to recall whatever they could from the video. Recalls at times 1 and 2 were correlated 0.078. Knowledge correlated 0.206 with recall 1, whereas interest correlated -0.004 and the number of strategies correlated -0.371. On the second occasion, knowledge, interest, and strategies correlated 0.059, 0.419, and 0.364 respectively with the amount of recall. Results fail to support the knowledge component in a model of domain learning in music therapy but support the minor influence of individual interest and strategies together with a social disposition that correlated 0.324 with recall at time 2. (Contains 7 tables and 13 references.) (Author/SLD)

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OCCASIONAL PAPER
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# AN EVALUATION OF A MODEL OF DOMAIN LEARNING: SOME PRELIMINARY DATA ON THE EFFECT OF STUDENTS' KNOWLEDGE, INTEREST AND STRATEGIES IN THE ACCLIMATION STAGE OF LEARNING

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# AN EVALUATION OF A MODEL OF DOMAIN LEARNING: SOME PRELIMINARY DATA ON THE EFFECT OF STUDENTS' KNOWLEDGE, INTEREST, AND STRATEGIES IN THE ACCLIMATION STAGE OF LEARNING

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**ABSTRACT**

The purpose of this paper is to evaluate the role of interest, knowledge and learning strategies on recall within a specific subject domain at an early stage of learning. Students (N=17) at two levels in a postgraduate music therapy course were assessed for their level of prior knowledge, interest, and the number of strategies they used to process information. They were presented with a video clip of a music therapy session and asked to recall as much as they could of what transpired. The following week they were asked again to complete further questionnaires and to recall whatever they could from the video. Recall at times 1 and 2 were correlated 0.078. Knowledge correlated 0.206 with Recall 1 whereas interest correlated -0.004 and the number of strategies correlated -0.371. On the second occasion, knowledge, interest and strategies correlated -0.059, 0.419, and 0.364 respectively with the amount of recall. Results failed to support the knowledge component in a model of domain learning in music therapy but supported the minor influence of individual interest and strategies together with a social disposition that correlated 0.324 with Recall at time 2.

## AN EVALUATION OF A MODEL OF DOMAIN LEARNING: SOME PRELIMINARY DATA ON THE EFFECT OF STUDENTS' KNOWLEDGE, INTEREST, AND STRATEGIES IN THE ACCLIMATION STAGE OF LEARNING[1]

Each student brings to a subject a unique personal background as well as idiosyncratic variations in his/her prior knowledge, interests and learning approaches. These factors act in concert with instruction and the learning situation to determine the progress and course of human learning. These idiosyncrasies are typified in three actual case studies set out below and which are taken from the study reported in this paper. The demographic details have been varied randomly to preserve anonymity.

*Case study A.* This student is a 24 year old female in the second year of a music therapy course. She has a nursing background and came to the course from a family experience of the use of music in palliative care. On the *Vocational Preference Inventory* she recorded the maximum preference score on Artistic interests (scores range from 0 to 14 with an average for females of 6) but an extremely low score (2) on Social interests (scores range from 0 to 14 with an average for females of 7). In a group of postgraduate students, she indicated the highest level of interest in music but only moderate levels of knowledge. She used a wide variety of strategies in learning and her level of recall concerning the details in a video of a music therapy session increased from week 1 to week 2. In her class she displayed the highest level of recall after one week.

*Case study B.* Case Study B is a 37 year old female in the first year of a music therapy course. She has a background in nursing. On the *Vocational Preference Inventory* she recorded a below average score of 4 on Artistic interests but an above average score of 10 on Social interests. Her recall for the same video based task over a period of one week decreased. In a group of postgraduate students, she indicated high levels of interest in music and average levels of knowledge. She used even more strategies in learning than the student in Case Study A.

*Case study C.* This is a 28 year old female also in the second year of the same music therapy course. Her background is from a music conservatorium and she has the highest level of musical skills and experience. On the *Vocational Preference Inventory* she displayed moderate levels of Artistic and Social interests. Her major preference was Investigative (ie., for Scientific activities). Her level of recall decreased from week 1 to week 2. She indicated that she used only around two strategies in her learning compared with 10 or more for many other students. Her level of interest in music and her knowledge were high.

These real-life scenarios emphasise individual differences in the first stages of formal learning and highlight some of the intricacies of academic learning. Commonly-used indicators of the outcomes in academic learning involve the recall of relevant knowledge, the performance of specific skills or the maintenance of

[1] An earlier version of this paper was presented at the Annual Conference of the Sydney Section of the College of Educational & Developmental Psychologists, Australian Psychological Society, November 1998.

particular attitudes. Over a period of time it is normally expected that there will be increases in the complexity of information recalled, the speed or accuracy of the skill as well as the commitment to occupational attitudes or values. The levels of learning have been considered to progress both quantitatively and qualitatively through various stages which are now often described as novice, through to competence (usually after three years), and sometimes on to proficiency or even expertise in a few cases.

Recently, a model of domain learning has been developed within a framework of the staged formation of skills, knowledge and attitudes. This model (see Alexander, 1997) combines motivational and cognitive components and is proposed to account for learning and recall in a specific subject area. In the first part of the paper, we outline the model of domain learning developed by Alexander (1992, 1997) and in the second section we report the first results from a larger program of research. This investigates students during their learning within a specific music skills subject at two stages of post-graduate music therapy training. We then relate these results to those predicted by the theoretical model of domain learning. Our primary focus was the effect of prior knowledge, student interest and learning strategies on the recall of salient material.

**Overview of a model of domain learning**

The model of domain learning proposed by Alexander (1997) sought to describe some of the factors that have an impact upon learning in a domain or field of study (i.e., academic subject area). A domain encompasses the knowledge, skills and attitudes that need to be taught specifically and that would normally be expected to lie outside the normal range of everyday experiences. Within the model of domain learning three longer-term experience-based stages (see Figure 1) are proposed – acclimation, competence and expertise – and within each of these stages there are shorter-term phases, almost like epicycles. The stages are progressive and incremental. Once a learner has progressed to a higher stage, it is considered unlikely that he/she will return to an earlier stage of development.

*Stages of domain learning*

These stages are reminiscent of other models of expertise, such as those of Berliner, as well as with the much earlier models of skill learning proposed by Fitts. The model of domain learning is directed towards the relatively short time periods that are a feature of much academic learning and which may not be adequately explained by other theories of learning, such as Piaget. Our concern is with the acclimation stage of academic learning.

Insert Figure 1 about here

In the acclimation stage, the learner is building familiarity with the domain by putting together a network of facts and ideas. As a consequence, the learner is required to determine the relevance of new information and this may or may not be done correctly. For example, they may rely on limited heuristic devices for their strategies. It is also possible that learning is influenced by extrinsic motivation or task achievement factors.

Insert Figure 2 about here

*Primary forces in domain learning*

A second aspect of the model of domain learning that takes it well beyond the stage theories of learning is its proposal that three primary forces - knowledge, interest and strategic processing - interact with the three stages of learning. The aspects of these forces are described in Table 1 and a tentative arrangement illustrated in Figure 2. For instance the model recognised that learning was related to corresponding shifts in a learner's interest and that individual interest would rise as individuals become more knowledgeable in a domain (see Alexander, Murphy, Woods, Duhon & Parker, 1997, p. 121). The model of domain learning purports to define growth in domain learning by the measurement of the changing components of the learner's knowledge, interest and strategic processing.

Insert Table 1 about here

Subject-matter knowledge is described as the knowledge an individual possesses relative to a particular area of study (e.g., music) and comprises domain knowledge and topic knowledge (Alexander, Jetton, & Kulikowich, 1995). Domain knowledge is the subject-specific knowledge whereas topic knowledge is defined as the awareness of a sub-set of ideas. Alexander, Kulikowich and Schulze (1994) tested the influence of subject matter knowledge on the level of comprehension of a personally-involving passage dealing with Stephen Hawking and Grand Unification Theory and found that topic knowledge, domain knowledge and interest were significant predictors of understanding. For an abstruse technical passage on truth quarks, only domain knowledge and interest were significant predictors for college students. Domain knowledge of music therapy was the area assessed in this study.

The concept of learner interest also features in two forms within the model of domain learning, as individual and situational interest. Individual interest has been described as a long-term relationship with the subject or involvement in a topic area, whereas situational interest represents the transitory arousal or attention from the immediate context (Hidi, 1990). The link between familiarity and interest in a subject and their positive effects on learning have been noted elsewhere. For instance, Alexander, Jetton & Kulikowich (1994, p.564) reported correlations of 0.45 between interest in Viral Nucleic Acids and recall and 0.63 for interest in Bacteriophage and recall for 30 premedical and 17 educational psychology graduate students. The interest assessed in this study was the level of individual interest in music therapy.

Strategic knowledge considers how the ways in which people overcome their lack of understanding or the problems they face in learning. It includes general strategies such as summarising, or self-checks on accuracy and the observation of one's learning (see Garner & Alexander, 1989). For the purposes of this study the strategic processing concepts related to how people overcame the need to recall aspects of a video presentation. The model of domain learning presumes a decrease in the role that general strategies play in academic performance, due to the increase in significance of the students' domain knowledge and therefore less dependence on learning strategies. This is illustrated in the study by Alexander et al. (1997) which explored changes in knowledge, interest and strategy use following formal instruction. They used 329 college students enrolled in an introductory educational psychology class. The correlation

between domain knowledge and strategy use declined from 0.32 prior to instruction to 0.15 following instruction (p. 141).

**The scope of this study**

Despite the potential of the model only a few domains of learning have been covered, such as literature, psychology, social studies, science, mathematics and computer science and mainly with undergraduate students. This paper will concentrate on describing a pilot study within the field of music therapy and with persons at the acclimation stage of learning. Participants in this study completed a set of specifically designed music therapy tasks. The tasks were based on an earlier study by Alexander et al. (1997) in text-based domain learning, which included assessments of the learning strategies, interests and subject content knowledge of college students in an introductory educational psychology course. This study, however, was designed for a postgraduate music therapy context and was video-based rather than text-based. The fact that this study employs the domain of music therapy knowledge is unique yet not unrelated to previous domain research. The recall task was the dependent variable in this study and was chosen against the background of the model of domain learning, which nominates the significant role of subject-matter, interests, and general strategies in academic performance. We anticipated that the amount students would recall from the excerpt of the video of a domain-related music therapy session would be a reflection of their knowledge, interests, and strategies. These were the independent variables in our analysis.

Since the occupation of Music Therapist is classified as involving Social and Artistic personalities and interests (Gottfredson & Holland, 1996), an addition to the model of domain learning in this study was to consider the role of dispositional interests on recall. We used the personality typology formulated by Holland (1959) that classifies persons, environments and occupations because it is widely researched and supported by a variety of evidence in both educational and vocational psychology. The typology encompasses six major interests or dispositions (Realistic, Investigative, Artistic, Social, Enterprising and Conventional). Each of the personality types is defined in terms of characteristic vocational and avocational preferences, life goals and values, self-beliefs and problem solving styles, and competencies. The Artistic and Social personalities are described respectively as having

> ...a preference for ambiguous, free, unsystematized activities that entail the manipulation of physical, verbal or human materials to create art forms or products... behavioral tendencies lead in turn to an acquisition of artistic competencies (e.g., language, art, music, drama, writing) ... a preference for activities that entail the manipulation of others to inform, train, develop, cure, or enlighten ... These behavioral tendencies lead in turn to an acquisition of human relations competencies (e.g., interpersonal and educational) (Holland, 1997, pp. 23-24).

Dispositional interests, such as Artistic and Social, add another dimension to the model of domain learning because they summarise a person's learning history, large repertoires of behaviours and especially the experiences which they value and prefer.

## METHOD

*Participants.* The participants in this study comprised 17 post-graduate students from a course in music therapy at the Kuring-gai campus of the University of Technology, Sydney. The participants were all female, ranging in age from 22 to

57 years and made up almost the entire cohort in the two-year course. Permission to conduct the study was obtained from the Faculty and the Human Research Ethics Committee and participation in the study was voluntary. In exchange for participation, the students were granted credit towards the research component of their training.

*Instruments.* Five instruments were used in this study. They comprised an assessment of subject or domain knowledge, ratings of the level of interest, assessments of recall at two different times and an indicator of the number of learning strategies used in the recall task.

Domain knowledge test. The content for the knowledge test was based on the subject Music Skills, and related to theoretical music and music therapy knowledge. The test comprised 22 true-false questions and 8 short answer questions. The coefficient alpha for the 30-item domain knowledge test was 0.92. The Music Skills Test contained items such as those shown in Table 2.

Insert Table 2, 3, and 4 about here

Individual interest measure. Individual interest in concepts relative to the domain of music therapy and based on the subject Music Skills were assessed using 26 items rated on a scale from not very interested (1) to very interested (10). There was also an option to mark 'uncertain of the meaning' for each concept item. The alpha coefficient for this 26-item scale was 0.90. Sample items from the individual interest questionnaire are listed in Table 3.

Strategic processing. In conjunction with the recall task, students were also asked to record the strategies they employed in completing the task. The total number of potential strategies for video recall was 20. The learning strategy component provided a selection of 20 possible strategies that may have been used in the recall task. Typical strategies are listed in Table 4.

Vocational Preference Inventory. The *Vocational Preference Inventory* (Holland, 1985) is a personality inventory that uses occupational titles. Considerable information on the validity and reliability of the inventory has accumulated over some 40 years and is summarised in the manual for this questionnaire. The *Vocational Preference Inventory* requires a person to indicate which vocations they find appealing and sorts these into six major categories. Additional personality scores are also available. For the purposes of this study only the scores from the Artistic and Social categories were used.

Video recall. Included in the battery of measures completed by the students were two recall tasks. The students viewed a three-minute excerpt from a professionally produced video on a music therapy session (University of Melbourne & Australian Music Therapy Association). This was a 3 minute excerpt taken from a psychiatric setting. The excerpt features a discussion and voice-over by an experienced music therapist working with young adult clients. The musical interaction is based on improvisation. The students were asked to make a note of all that they could recall. The tasks were scored by tallying one point for each event recalled. The scoring was checked by an independent marker.

*Procedure.* Students completed the knowledge test, interest scale and then viewed the video excerpt before completing the first recall task and then indicating their learning strategies. After one week students completed the *Vocational Preference Inventory* and were also asked to recall as much of the video excerpt as they could.

*Analysis.* The Spearman rank correlations between recall at times 1 and 2, level of knowledge, interest, strategy use, and Artistic and Social scores were computed. The performance of first and second year students on the recall tasks was also compared using the non-parametric Mann-Whitney test for significant differences in the median scores of the two groups.

## RESULTS

Table 5 indicates the summary statistics for the group and Appendix A lists the original scores or observations for the 17 students. Results indicate considerable variation on all the variables assessed.

Insert Tables 5, 6 about here

There were no significant differences in the mean level of recall at time 1 between the first and second year music therapy students. Both groups recalled an average of 16.5 items (see Table 6). At Time 2, the level of Recall decreased for both the first and second year group but the decrease was marginally less for the second year group. The recall differences at Time 2 were not statistically significant (Mann-Whitney U, Group 1=17.5, Group 2=32.5, z=0.86). Furthermore, there were no significant differences between the groups on the independent variables of ratings of knowledge, interest, strategies, Artistic and Social.

***Role of knowledge, interest and strategies in recall***

The intercorrelations between scores on recall, knowledge interest and strategies are listed in Table 7. Recall at Time 1 was correlated only 0.078 with Recall at Time 2 indicating that these were largely independent responses. Furthermore, the variables - knowledge, interest, strategies and Social interest- were not correlated significantly with Recall at Time 1. Only Artistic was correlated significantly (r=-0.741, p=0.01) but in a negative fashion with Recall at Time 1, meaning that the lower the number of Artistic preferences then the greater the recall at Time 1. The multiple correlation of the six variables with Recall at time 1 was 0.81 (R-squared = 0.672).

At Time 2, however, Recall was related positively (but not significantly p=0.01) to the level of interest, the number of learning strategies, Artistic and Social interests though not to the level of knowledge. The multiple correlation (0.64, R-squared=0.416) of the six variables on time 2 Recall was not statistically significant.

Insert Table 7 about here

## DISCUSSION AND CONCLUSIONS

The role of the key variables within the model of domain learning and their effect on recall were investigated in this study. Firstly, there was an expectation that there might be some differences between the first and second-year students but the pattern of performance within groups were so heterogeneous that there were no clear trends. There were no statistically significant differences in the performance of first and second year students in recall, interest, knowledge, or strategy-use indicating that both groups were operating at around the same level of learning in the acclimation stage.

Secondly, it was anticipated that domain knowledge, individual interest and the number of strategies used would correlate with a higher level of recall but this was not supported. This finding failed to support the model of domain learning and possible reasons for this may include: (a) the task was video-based rather than text-based; and (b) the task for recall was of such short duration; and (c) the task involved both music and therapy components. In addition, the small sample of 17 students might also be considered as a factor that affected results but the analyses focused on non-parametric statistics and were relatively consistent in not supporting the model of domain learning. Moreover the instruments used in the study had more than reasonable levels of internal consistency reliability lending some weight to the potential accuracy of the findings.

Thirdly, a further limitation is that the postgraduate students in the study were already a selected group leading to a restriction of range in the levels of knowledge, interests and strategies. There may not have been sufficient variation within this group as there would be in using learners from diverse backgrounds. This argument is appealing from a statistical viewpoint but overlooks the fact that many learning situations already include highly selected samples and indeed at the post-school levels of education and training there is increasing selection with each passing year.

Fourthly, findings did not reveal any significant correlations between the three components of the model of domain learning. Even when dispositional interests were added, there was no clear pattern other than the negative effect of Artistic preferences on the level of Recall at Time 1. It was almost as though artistic interests acted as an inhibitor for recall. It may well be that music therapy is focused more on social interests, knowledge, strategies and dispositions than might be imagined at the outset.

A fifth consideration is the potential limitation of the study's use of a single three-minute exposure. This reduces the study to what is in essence a one-trial learning and uses a recall task that may impose far too strict a criterion for the development of learning. Future studies might focus on tasks with repeated exposures that would offer a more meaningful test of the model of domain learning. Nevertheless at time 1 there were some people who recalled 26 aspects of the music therapy session compared with only 8 aspects for other students and the model of domain learning did not account for this difference. On the other hand the decline in recall from Time 1 to time 2 was quite large in some cases (as high as 20) and quite difficult to explain.

The introduction of dispositions into the model of domain learning adds another feature to the model and one that does not make it unnecessarily complex or unwieldy. In some cases the Artistic and Social dispositions explained more of the variance in recall than some of the key forces in the model of domain learning.

Future studies are already underway with additional populations that have either musical or therapeutic backgrounds as well as with others that have neither musical nor therapeutic interests. This will introduce greater variation into the model and hopefully provide a clearer picture of how the different forces correlate with recall. The final stage in this program of research is to modify the tasks to determine whether this may introduce artefacts into the research outcomes.


## Acknowledgements

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**Appendix A**

| Recall 1 | Recall 2 | Knowledge | Interest | Strategies | Artistic | Social |
|---|---|---|---|---|---|---|
| 8 | 8 | 24 | 167 | 11 | 12 | 6 |
| 11 | - | 20 | 216 | 5 | - | - |
| 13 | 5 | 27 | 169 | 9 | 14 | 9 |
| 14 | 8 | 21 | 204 | 7 | 5 | 7 |
| 14 | 10 | 30 | 243 | 14 | 13 | 10 |
| 15 | 22 | 26 | 167 | 12 | 13 | 12 |
| 15 | 8 | 27 | 158 | 10 | 12 | 6 |
| 15 | 18 | 19 | 247 | 12 | 14 | 3 |
| 16 | 11 | 25 | 174 | 5 | 12 | 7 |
| 16 | 9 | 19 | 188 | 5 | 9 | 2 |
| 16 | - | 30 | 178 | 0 | | |
| 17 | 15 | 25 | 203 | 2 | 7 | 6 |
| 18 | 11 | 29 | 195 | 8 | 8 | 8 |
| 21 | 15 | 26 | 224 | 13 | 4 | 10 |
| 21 | 6 | 24 | 178 | 3 | 8 | 5 |
| 25 | 5 | 26 | 168 | 3 | 3 | 3 |
| 26 | 9 | 27 | 175 | 7 | 2 | 6 |

Figure 1. Stages in the development of domain learning

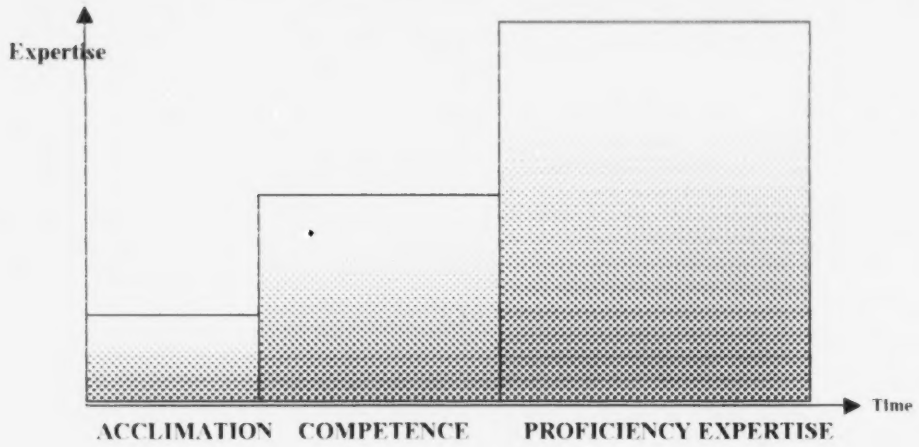
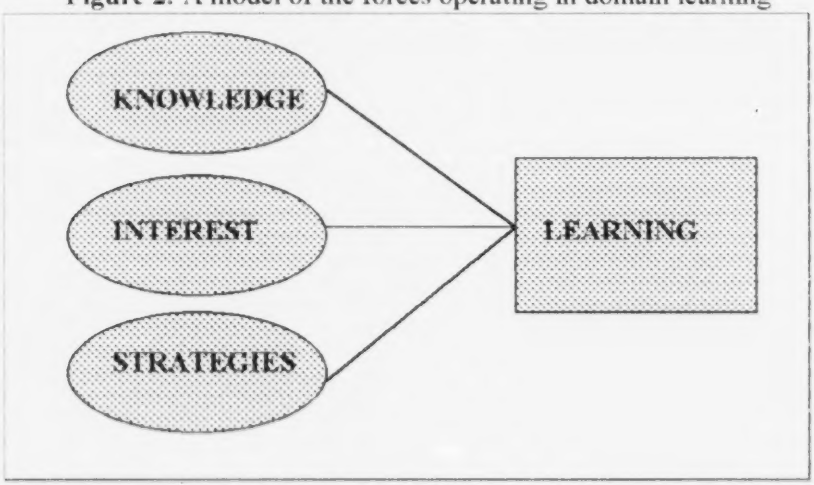



Figure 2. A model of the forces operating in domain learning

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| PRIMARY FORCE | COMPONENTS |
|---|---|
| SUBJECT MATTER KNOWLEDGE | • Domain Knowledge (e.g., declarative, procedural and conditional knowledge)<br>• Topic Knowledge (e.g., subject specific concepts) |
| INTEREST | • Individual interest (e.g., personal interest)<br>• Situational interest (e.g., temporary interestingness) |
| STRATEGIC KNOWLEDGE | • General cognitive strategies (e.g., notetaking, re-reading)<br>• Metacognitive strategies (e.g., self-assessment of learning)<br>• Self-regulatory processes (e.g., purposeful procedures to increase performance) |

**Table 1.** Primary forces in the stages of domain learning

*True-False*

- Kodaly Music Education was developed in the United States
- Improvisation is contra-indicated for children with cerebral palsy
- A melody line A, G, F#, G & D is best harmonised using A7
- The name synonymous with analytic music therapy is Juliett Alvin

*Short Answer Questions*

The Nursing Unit Manager of a children's ward has asked you to visit a child who is refusing to eat. The child is four years of age, is mildly developmentally delayed and is receiving treatment for a broken leg. The child is responding to all medical and non-medical interventions with extreme withdrawal.

Identify three needs for the child...

**Table 2. Sample questions from the Music Skills Test**

- Improvisation

Not very interested Interested

uncertain of meaning of concept

- Melody...
- Children's music...
- Therapeutic style...
- Musical games...
- Individual therapy...
- Group therapy...

**Table 3. Sample items from the interest questionnaire**

Possible strategies that you used in your recall (video) task:

- Comparison of yourself to the music therapist
- Remembering colours
- Looking for movements
- Identifying instruments
- Evaluation of music therapy method
- Remembering spoken words

**Table 4. Sample items from the strategic processing questionnaire**

Table 5. Descriptive statistics

| Variable | Mean | Std Deviation | Minimum | Maximum |
|---|---|---|---|---|
| Recall1 | 16.5 | 4.6 | 8 | 26 |
| Recall2 | 10.6 | 4.8 | 5 | 22 |
| Knowledge | 25 | 3.5 | 19 | 30 |
| Interest | 191.4 | 27.4 | 158 | 247 |
| Strategies | 7.4 | 4.1 | 0 | 14 |
| Artistic | 9.0 | 4.1 | 2 | 14 |
| Social | 6.6 | 2.8 | 2 | 12 |

Table 6. Recall scores at Times 1 and 2

| Recall | First year Mean (SD) | Second year Mean (SD) |
|---|---|---|
| Time 1 (N=17) | 16.5 (5.0) | 16.5 (4.3) |
| Time 2 (N=15) | 10.1 (4.9) | 11.8 (4.9) |

Table 7. Spearman rank correlations

| | Recall2 | Knowledge | Interest | Strategies | Artistic | Social |
|---|---|---|---|---|---|---|
| Recall1 | 0.078 | 0.206 | -0.004 | -0.371 | -0.741 | -0.285 |
| Recall2 | - | -0.059 | 0.419 | 0.364 | 0.173 | 0.324 |
| Knowledge | | | -0.231 | 0.131 | -0.001 | 0.585 |
| Interest | | | | 0.131 | -0.081 | 0.040 |
| Strategies | | | | | 0.502 | 0.568 |
| Artistic | | | | | | 0.216 |
| Social | | | | | | - |

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